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ABSTRACT

The differentiation between efficiency and effectiveness in evaluating the performance of institutions of higher learning is examined and the role of management information systems in the decision-making processes of such institutions is explored. While efficiency is primarily concerned with cost minimization concepts, effectiveness is concerned with the achievement of organizational goals. Management information systems--which gather data and organize them into meaningful, timely flows of information for the decision-making process--must consider the characteristics of amount, form, and flow of information, as well as the effectiveness and efficiency criteria of successful decisions. If it is accepted that colleges do in fact have an impact on student outcomes and are concerned with how they contribute to those outcomes, then it is appropriate to consider how data about such outcomes can be included in the information systems used by the colleges in making decisions. The data bases used must include data relevant to the defined student outcome goals and objectives of the institution. Several efforts made to develop data bases that do include information relevant to student outputs are described. A management information system that incorporates student outcomes has been developed which may make it possible for the academic decision-making process, as well as future evaluations and accountability studies, to address directly a more comprehensive group of efficiency and effectiveness criteria. (SC)

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EFFICIENCY, EFFECTIVENESS, AND MANAGEMENT INFORMATION SYSTEMS IN HIGHER EDUCATION

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ABSTRACT

This paper focuses on the definition and differentiation of the two terms "efficiency" and "effectiveness." Efficiency is said to be primarily concerned with cost minimization concepts. Effectiveness, on the other hand, is presented as a goal achievement type of concept. The importance of this distinction to institutions of higher education is discussed and differentiated from that of the more traditionally profit oriented types of organization.

Next, the relationship of Management Information Systems to the decision-making process in institutions of higher education is discussed. Finally, a recent paper by A. W. Astin on the use of student outcome data in Information Systems is discussed as an example of providing input for effectiveness in the decision making process. It is concluded that the use of management information systems in higher education must include student outcome data related to effectiveness criteria as well as to traditional efficiency criteria.

Inherent in the planning and resource allocation process is the making of a decision or a choice among several alternative strategies. The theories of administration have traditionally regarded the decision process as one which is central to the activities of those involved in the planning process. Lipham [15, p. 104] cites several authors who assert the fact that decision making is a central concern of the administrative process.

Several theories of decision making focus on the characteristics of the information which the decision maker wishes to have available. It is this feature which becomes a key to the understanding of the decision making process. Filley and House [11, pp. 107-108] describe the "economic man" theory of decision making as being one in which the decision maker is ominscient, having at hand all the required information, and a perfect knowledge of the future. The decision maker then acts in a completely rational manner, for there is no need for judgement and evaluation. Simon's [23, p. 241] Administrative Man theory of decision-making is less demanding, and posits a "bonded rationality" which acknowledges that no one can possibly have complete knowledge about all relevant information. It also posits decision behavior that searches for an acceptable solution, which is immediately elected as the final choice, and the process of searching for other alternatives is discontinued. Soelberg [24, pp. 3-16] asserts that neither conceptualization is a valid description of the decision process, and posits the confirmationist theory of decision making. This description suggests that decision makers first search for an acceptable alternative

for the decision situation at hand. Even when one is found, the search process for other alternatives continues, with other possible choices being compared to the original choice on the basis of the limited information at hand to confirm its superiority. Should another alternative appear to be better than the first, it will be accepted and the original choice eliminated. All three of these theoretical descriptions of the decision process depend on the availibility of adequate information to the individual decision maker.

Lipham states that "information serves as the basis for decision making ..." [15, p. 6] He also suggests that in considering the topic of information, amount, form, and flow are among the important characteristics to consider. Some decisions require more information than others, and the amount of information available to the decision maker will have an influence on the decisions made. However, the amount of information that is available will be of little use unless it is presented to the decision maker in a form which is useful in assisting in the evaluation of the various alternatives available. Finally, information which is not made available to the decision maker until after the decision is made is also of little use. The timing of the flow of information is also important to the decision making process.

Information systems provide data for making decisions about how to allocate resources among various competing programs. In order to evaluate these decisions, the information must be provided in terms of the criteria of successful decision making. Vroom and Yetton [25] suggest three separate criteria for

evaluating the degree of success in decisions. First, the decision must demonstrate technical quality. Next, it must be one which is acceptable to those who are to be involved in implementing it. Finally, they suggest that the amount of time taken to reach the decision is an important criterion for evaluating a decision.

Reitz [22, p. 158-159] labels his criteria for successful decisions as efficiency and effectiveness. Efficiency criteria include the cost of making the decision and the time which elapses between the recognition of the problem and the making of the decision on how to cope with it. Effectiveness criteria include the extent to which the problem is correctly evaluated, costs assessed, and benefits of alternatives determined, as well as the likelihood of carrying out the decision that is made, and finally the support acquired from the people required to implement the chosen alternative.

It seems logical to conclude that Management Information Systems, the purpose of which is to gather data and organize them into meaningful, timely flows of information for the decision making process, must consider the characteristics of amount, form, and flow of information, as well as the effectiveness and efficiency criteria of successful decisions.

In the study of higher education, if it is accepted that colleges do in fact have an impact on student outcomes, and that some colleges are concerned with how they contribute to those students outcomes, then it is appropriate to consider how data about such outcomes might be included in the information systems which colleges and universities use in making their decisions.

Currently, the state of the art for considering student outcome information in making decisions is minimal.

> "Although most college catalogues claim that student development is a fundamental institutional purpose, the decision-making process in higher education often ignores the student implications of alternative courses of action. This tendency is exemplified by the computer-based management information systems now used by many colleges and universities. Except for simplistic information on enrollments, majors, and credits, these systems provide almost no information on students. Administrators who rely on such systems are thus encouraged to view planning and decision-making basically as a problem in manipulation of resources. The 'benefit' side of the decision-equation, as reflected in the likely consequences for student development, is given scant attention at best and, in most cases, is left out of the decision process altogether." [4, p. 1]

Any organization has the responsibility to use its resources efficiently and effectively, especially those which use public tax dollars for a large proportion of its expenditures. Both public and private institutions of higher education fall into this category. It is often understood that efficiency and effectiveness are somewhat similar, and little effort is normally made to differentiate one from the other. A major point of this paper, however, is that there is a significant difference in kind between these two concepts, and that an evaluation based only on efficiency criteria, without also including effectiveness criteria is improper for rational administration.

Efficiency is generally defined as the ratio of constant quality outputs (in the numerator) to inputs (in the denominator). The larger the ratio, the more efficient is an organization. This ratio may be increased by either increasing the output (numerator) while holding quality of output constant, without increasing the input (denominator), or conversely, by

decreasing the input without decreasing the constant quality output. Both manipulations will have the effect of increasing efficiency. Efficiency is a highly valued concept, and well it should be. But without proper attention to the effectiveness of the operation, efficiency can be a meaningless measure.

Effectiveness is defined differently. It is concerned with the achievement of objectives, or desired outcomes. To the extent that the institution is achieving its desired outcomes, it can be called effective. Drucker characterized efficiency as "doing things right," while effectiveness was characterized as "doing the right things." [10, p. 7] It is clear that an institution which is very efficient need not be effective. The degree awarded may be of low quality, the students may not have learned very much, or they may not have developed as the institution expected them to. Even if the institution is processing many students, and awarding many degrees with limited resources (efficient), it may not necessarily be effective (not achieving desired outcomes). As Dressel states, "Increasing the number of students per teacher (an apparent increase in efficiency) probably lowers quality (effectiveness) of education." [9, p. 79]

The emphasis on efficiency comes from the business segment of our economy. "Traditionally, business and industry have used efficiency of operation to determine the value of specific management procedures." [5, p. 10] This emphasis has been carried over to the educational institutions, primarily by people from business who serve as elected or appointed officials to the governing boards of educational institutions. One such approach,

by Leonard [14], describes productivity in higher education as simple efficiency, defined as fewer dollars per student, without any consideration of student outcomes.

There is a logical reason for the business segment to emphasize efficiency over effectiveness. If, as capitalism suggests, the goals of business can be defined as maximizing profit, or maximizing return on investment to the owner of a business, then the logical behavior of a manager is to minimize costs while at the same time maintaining or increasing a constant quality output. The objective of business is to be efficient! In profit motivated enterprises, such as businesses in a free enterprise economy, effectiveness is efficiency, by definition. As long as the objective of an organization is to maximize dollar output relative to dollar input, the organization can be effective only if it is efficient.

However, in organizations which have goals and objectives other than maximizing a profit for the investor, efficiency and effectiveness take on different meanings. The individual with experience in business must understand that the synonymous relationship between efficiency and effectiveness no longer exists in eleemosynary institutions. Efficiency and effectiveness now take on the meanings "doing things right" and "doing the right thing," respectively.

Only the few proprietary institutions of education can claim to be profit oriented. Most others exhibit goals and objectives which suggest some sort of student outputs. Effectiveness in these institutions can only be determined by examining the extent to which the students achieve output objectives.

Efficiency becomes an entirely separate matter. An effective institution can be either efficient or inefficient. These dimensions become separate and distinct indicators of accountability for the administrators in institutions of higher education.

Since most college catalogues claim that the achievement of some students' outcomes are among their fundamental objectives [4, p. 2], it becomes imperative that administrators have information about the effect of their actions on students. Yet current information systems seem to overlook this need. The amount of information on student outcomes is minimal. Bayer states, "Sound administrative decision-making in higher education requires thorough sociological knowledge of a college's environmental characteristics ... and their impact on students' growth and development. ... But rarely have educational decisions been grounded in empirical data and systematic analysis: rather they are usually based on economic constraints, political pressure, tradition, folklore, and anecdotal information." [6, pp. 549-550] Corson notes that "The accounting systems utilized by most colleges and universities do not provide the information required for such decisions." [7, p. 159] The information systems available to decision-makers in higher education seem not to have allowed for the "amount, form, and flow" of student outcome information.

While discussing a core data base in a paper on information systems in higher education, Craven lists six basic data areas including curriculum, students, facilities, personnel, finances, and environment. [8, p. 132] It is difficult to infer from

this list of data areas that this framework is concerned with student outcome data. Other references in this article allow for the differences between efficiency and effectiveness, but the collection and processing of student outcome data is overlooked. [8, pp. 135-136]

Those institutions that are concerned with student outcomes as high priority objectives must formally develop and state them. Logically then, information systems which measure and process data for decision-makers must be designed with those institutional goals and objectives in mind. The data bases must include data relevant to the defined student outcome goals and objectives of the institution.

Several efforts have been made to develop data bases which do include information relevant to student outputs. One of them is that developed by Perry. [20] [21] In a four phase research project begun in 1953, he gathered and analyzed enough data to be able to generalize a three-stage learning process for students: moving from dualism to relativism; exploring relativism; and developing commitments and identity to specific norms and values. As a theoretical framework, it "... describes students' developmental processes in a unique way: i.e., through forms of thought and styles of establishing values and personal identity. It describes how students progress in levels of thinking complexity, how that leads to a merging of knowledge and values, and how a sense of identity is established." [12, p. 493] "... It represents a compelling framework for an 'ideal' educational process, a normative basis for judging educational outcomes." [12, p. 494] This approach appears to be the first in the field,

even though the articles reporting it were only published in the last nine years. It is psychological in orientation, imposing normative results based on a specific value structure.

Another project that has developed measures of student outcomes is one headed by C. Robert Pace. [19] This loose leaf collection of numerous small surveys provides many potential measures of a variety of student outcomes. The major benefit of this kit is that about half of the measures provided have been normed against approximately 7,500 upperclassmen at 80 colleges and universities. These colleges and universities have been classified into eight different groups, ranging from general comprehensive universities, through general liberal arts colleges, to special purpose institutions such as teacher training colleges. Thus, an administrator has an opportunity to make comparative analyses of the results of surveying the students of the local institution with the normed results of other like institutions.

The National Center for Higher Education Management Systems (NCHEMS) at the Western Interstate Commission for Higher Education (WICHE) has published three documents which address the issue of measuring personal development of students. [16] [17] [18] Their work began after a conference conducted by WICHE in cooperation with the American Council on Education and the Center for Research and Development in Higher Education at Berkeley. [13] Their research resulted in eleven major outcome areas, to be measured by specific scales and items. These researchers have provided a large and comprehensive list of outcome items and many potential indicators of personal development of students.

Astin [1] [2] [3] began the Cooperative Institutional Research Program (CIRP), sponsored by the American Council on Education (ACE), which has gathered data on incoming freshmen since 1966. In 1970, the same research team conducted a follow-up survey of graduating seniors who had enrolled in the fall of 1966. This "Senior Survey" was designed to determine student aspirations, attitudes, religious preferences, and other detailed information about the students' college experiences. Based on a model of college impact on students, the Astin studies analyzed the impact of the college environment on students in a comparative study of several hundred institutions.

Astin [4] has suggested a management information system which incorporates student outcomes. It is his concern that such systems include the kind of data which can shed light on the impact of the institution on the student. This is an effectiveness emphasis, concerned with the degree to which the institution has achieved the goals of student development and change. The data and information available from traditional management information systems is directed at the questions of fiscal responsibility and economic efficiency. While these emphases are important, so are the effectiveness criteria emphasized by Astin's approach.

This is the first attempt in the literature to legitimately modify the standard type of management information system from industry for post-secondary institutions of education. By recognizing the difference between efficiency and effectiveness, and explicitly acknowledging the existence of student development objectives, he has been able to creativly adapt a managerial technique from industry to higher education. With the recognition

that such data, in proper amounts, form, and flow are necessary to administrators, it may now be possible to frame the goals and objectives of education in such a way that the information systems can develop realistic measures of data on student outputs. By integrating these data into an information system of the type described by Astin, the decision making process, as well as future evaluations and accountability studies in institutions of higher education may be able to address directly a more comprehensive group of criteria. The simple reliance on efficiency criteria should give way to the dual criteria of efficiency and effectiveness! This can only aid administrators in their attempts to rationally and logically make decisions aimed at providing high quality education at a cost that is affordable to both students and to taxpayers.

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